REMARKS

This paper is in response to the Office Action of April 1, 2003. The due date for response extends to September 2, 2003, with a two month extension, which is hereby petitioned for. September 1, 2003 is a Federal Holiday.

Claims 13-20 were cancelled.

Claims 21-45 were added.

Applicants appreciate the Examiner's thorough review of the present application, and respectfully request reconsideration in light of the foregoing amendments and the following remarks.

Claim 11 has been amended and independent Claims 24 and 38 have currently been added so as to recite a proper patentable scope. It is respectfully submitted that all of the amendments are fully supported by the original disclosure of this application and therefore do not introduce any new matter.

Amended claim 11 is directed to a method for manufacturing a buffer layer of a light emitting semiconductor device that comprises the steps of providing a substrate, supplying an organic metal gas, and supplying a nitride gas to react with layers formerly formed by the organic metal gas, thereby the buffer layer is composed of at least one material selected from the group consisting of metals and compound semiconductors.

Added claim 24 is directed to a method for manufacturing a buffer layer of a light emitting semiconductor device that comprises the steps of providing a substrate, supplying an organic metal gas, supplying a nitride gas to react with layers formerly formed by the organic metal gas, and repeating the steps of supplying the organic metal gas and supplying the nitride gas in sequence so as to form the buffer layer composed of at least one selected from the group consisting of the layer and a metallic nitride layer.

Added claim 36 is directed to a buffer layer of a light emitting semiconductor device, wherein the light emitting semiconductor device includes a substrate with the buffer layer disposed thereon, a light emitting semiconductor layer, and electrodes, thereby the

buffer layer is manufactured by the method claimed in claim 11.

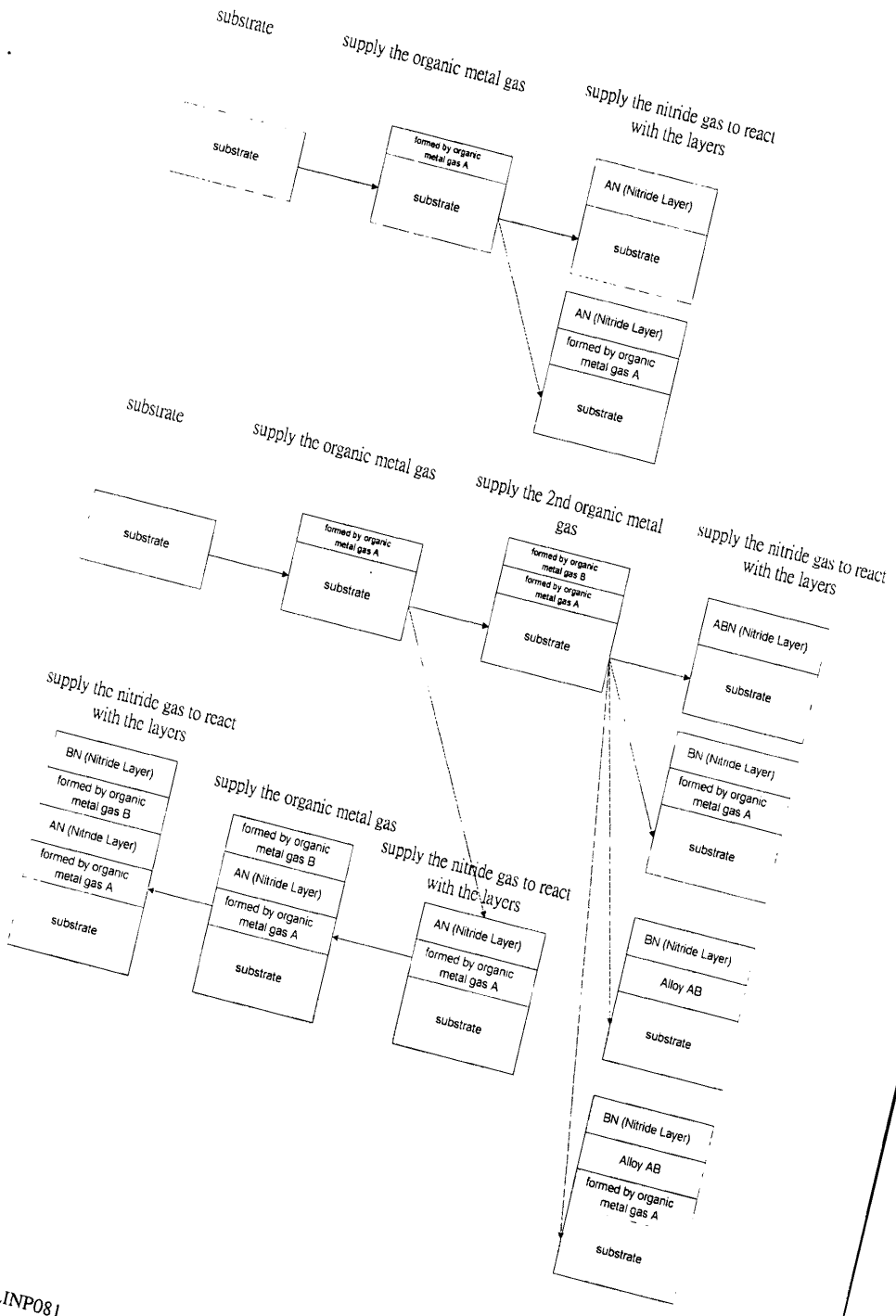
Added claim 37 is directed to a buffer layer of a light emitting semiconductor device, wherein the light emitting semiconductor device includes a substrate with the buffer layer disposed thereon, a light emitting semiconductor layer, and electrodes, thereby the buffer layer is manufactured by the method claimed in claim 24.

Added claim 38 is directed to a method for manufacturing a buffer layer of a light emitting semiconductor device that comprises the steps of providing a substrate, supplying an organic metal gas, supplying a nitride gas to react with layers formerly formed by the organic metal gas, and repeating the steps of supplying the organic metal gas and supplying the nitride gas in sequence so as to form the buffer layer, thereby the buffer layer is composed of at least one material selected from the group consisting of metals and compound semiconductors.

In brief, the features of the invention reside in:

Feature 1: As described in Attachment A, Applicants emphasize that it is possible to manufacture several types of the buffer layers according to the method of the invention. In detail, not only more than one kind of the organic metal gas can be supplied into the chamber so as to form the metallic layers on the substrate, but also various formations of the buffer layers can eventually be formed on the substrate.

Attachment A follows:



Feature 2: In specific, as illustrated in FIGs. 6 and 7 of this application and descriptions thereof, such as the descriptions of paragraphs [0021] and [0022], it is noted that the invention is characterized in that the claimed method is carried out by **supplying the organic metal gas and then supplying the nitrogen into MOCVD chamber**, so that it is possible to form the buffer layer which is composed of the metal layers and the alloys thereof, such as Ga, Al, B, As, In, etc., and more than three kinds of compound semiconductor layers, such as GaN, AlN, BN, InN, AlGaN, AlInN, InGaN, AlBN, InBN, InAsN, AlAsN, GaAsN, AlInGaN, AlGaBN, AlInBN, InGaBN, AlInAsN, AlGaAsN, AlInGaBN, AlInGaAsN, AlInGaAsBN, etc., highly depending on process and growth parameters.

In addition, in comparison with the conventional method as Applicants admitted, such as descriptions of paragraphs [0003] and [0004], since the conventional method generally supplies gases into MOCVD chamber simultaneously and thus allow them to mix therein, it is possible to cause reactants thereof to adhere on the wall of MOCVD chamber. However, once the temperature of the wall, which is generally made of stainless steel, is varied or an airflow is caused by the supplied gases, the particles are likely to fall on the surface of epitaxial layer and therefore will result in defects of LED device. By contrast, according to the currently claimed invention, which recites the feature of *supplying the organic metal gas and then supplying the nitrogen* into MOCVD chamber, it is suitable to form the buffer layer without the problems of pre-reaction, and therefore will enhance the yield.

Feature 3: The method of invention is also characterized in that the steps of supplying the organic metal gas and the nitrogen are repeated in sequence, thus it is possible to improve the manufacturing efficiency.

The Examiner rejected claims 11-23 under 35 U.S.C. §102(e) as being anticipated by Weber et al. (US Pub. No. 2002/0005566). Claims 17 and 18 were also rejected under 35

U.S.C. §103(a) as being unpatentable over Weber et al. In view of the amendments, the Applicants respectfully traverse the rejections. The following identifies several teachings that are lacking in Weber et al., and thus fail to teach or suggest the claimed invention.

1. The application describes a method of employing MOCVD equipment in growing the GaN material with Ga-polarity. To the contrary, Weber et al. disclose a method of employing MBE equipment in growing the GaN material. When the material of the buffer layer is GaN and the MBE-based method is applied to the epitaxy growth of GaN, the surface of the GaN is likely to have an N-polarity. Most of the time, this material yields a rough surface after etching. Thus, it would be difficult to carry out the etching process in order to form the n-mesa. Also, the reflectivity of the n-contact after metal deposition is not as good as a smooth surface, which results in poor pattern recognition in mass production when probing and sorting processes are performed.

2. Meanwhile, the rough surface will not only affect the LED fabricating process, but also the electrical characteristics of the LEDs. As is well known, a rough surface will more easily suffer from a leakage problem due to an uncontrollable surface leak path. In contrast, according to the method of the claimed invention, i.e. a MOCVD-based method, no matter whether the buffer is GaN or AlN, the surface of the GaN epitaxial layer will always show the Ga-polarity, which will prevent the problems addressed above. *It should also be noted that the method of the invention is suitable to form any type of metal layer and apply nitrogen gas thereto at a relatively high temperature, instead of Weber et al.'s method which is merely used to grow a Group III metal nitride, such as AlN and GaN.*

3. Due to the structure of MBE and the mechanism of epitaxial growth resulting from the same, Weber et al.'s method is required to produce an activated nitrogen by feeding a Constricted Glow Discharge (CGD) plasma source with pure nitrogen gas, such as 99.9995%. However, it is distinct from claimed invention since the latter utilizes a $NH_{3(g)}$, $N_{2(g)}$, $H_{2(g)}$, $Ar_{(g)}$, or an organic metal gas to perform the nitridation; in other words, an element is usually

employed to serve as the source in the MBE system, but the $NH_{3(g)}$, $N_{2(g)}$, $H_{2(g)}$, $Ar_{(g)}$, or the organic metal gas is used to serve as that in the MOCVD system such that both of them are distinct in the gas for epitaxy growth. However, the epitaxy growth of the MBE system could only be performed under the ultra high vacuum environment (i.e. normally below 10^{-10} torr). Compared with the MOCVD system, in which the base pressure of the growth environment does not limit at ultra high vacuum or vacuum, the method can be performed at low pressure (i.e. 10^{-1}~10^{-7} torr), atmosphere (i.e. 1 atm), or even at high pressure (i.e. higher than 1 atm). According to the obviously fundamental growth criteria, these two methods are significantly different especially in the source and base pressure of the growth environment. Indeed, the claimed methods cannot be said to be taught or suggested by Weber et al., as the chemical reaction mechanism is completely different. There is basically a significant difference between processes done by chemical vapor deposition (CVD) and physical vapor deposition (PVD).

According to the teaching of Weber et al., it is clear that a growth procedure to grow epitaxial Group III metal nitride thin films on lattice-mismatched substrates is disclosed, wherein N_2, Mg, Ga, Al are supplied into a MBE chamber. However, throughout the disclosure of Weber et al., it is found that the teachings are specific to a PVD mechanism, which is distinct from the CVD mechanism as recited in the claimed invention.

In view of the foregoing, the Applicants respectfully request that the Examiner withdraw the rejections of the claims. The newly added claims recite subject matter that is also considered to be patentable over the cited art for at least the same reasons provided above.

A Notice of Allowance is therefore respectfully requested.

If the Examiner has any questions concerning the present amendment, the Examiner is kindly requested to contact the undersigned at (408) 749-6903. If any other fees are due in connection with filing this amendment, the Commissioner is also authorized to charge Deposit Account No. 50-0805 (Order No. JLINP081). A duplicate copy of the transmittal is enclosed for this purpose.

Respectfully submitted,
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